

The present invention relates to an apparatus for depositing flux on a semiconductor chip and comprises a support for positioning the semiconductor chip at a predetermined location for depositing flux. The semiconductor chip has a plurality of flip-chip bumps arranged on the surface. The apparatus includes a jet printing head for printing a flux pattern on the flip-chip bumps. The flux pattern is substantially identical to an arrangement pattern of the plurality of flip-chip bumps on the semiconductor chip. Hence, the flux is deposited substantially only on the flip-chip bumps.

As claimed, the present invention deposits flux only on the flip-chip bumps, and not uniformly across the entire surface of the chip. This has a number of advantages, such as reducing the wasted flux randomly sprayed or brushed all over the entire surface of a chip, thereby reducing manufacturing costs. It also reduces the flux residue remaining on the surfaces of both the chip and the substrate, thereby reducing the risk of the device's functional failure during long term use due to stress corrosion caused by exposure to temperature and humidity. Such advantages were already pointed out in the present Application, which also described the prior art methodology of spraying or brushing flux over the entire surface of the chip.

Pine et al., U.S. Patent No. 5,164,022, actually seeks to apply a uniform film of flux to a solder work surface, and thus teaches directly away from the present invention. As stated at column 1, lines 6-10, "this invention relates generally to a method and apparatus for applying solder flux on to a pre-tinned work surface, and more particularly, to a method and apparatus for applying a uniform film of flux to a solder work surface . . .". Also, at column 2, lines 57-60, it states that "the inventive apparatus and method above described provides for the automatic dispensing of a uniform film of flux

on a solder work surface." Hence, it clear that Pine et al. does not provide a structure that meets the limitation of claim 6 that recites a jet printing head for printing a flux pattern on the flip-chip bumps such that the flux is deposited substantially only on the flip-chip bumps. Instead, Pine et al. provides for the dispensing of a uniform film of flux across a solder work surface. Also, Pine et al. does not employ a jet printing head suitable for printing a pattern, but rather a plurality of fixed holes 24 through which the flux is forced onto the work surface to form a uniform film of flux on the solder work surface. As Pine et al. does not disclose each and every feature of claim 6, it can not anticipate claim 6 under 35 U.S.C. §102(e). Reconsideration and withdrawal of the rejection of claim 6 under 35 U.S.C. §102(e) are therefore respectfully requested.

With regard to the rejection of Claims 7-12 under 35 U.S.C. §103(a), the combination of Master et al., U.S. Patent No. 6,098,867, with Pine et al. is inappropriate, since Pine et al. teaches and seeks an automatic dispensing of a uniform film of flux on a solder work surface. Furthermore, Master et al. does not overcome any of the deficiencies noted with respect to Pine et al., so that even if combined, the combination of Pine et al. and Master et al. do not show or suggest or make obvious the invention as now claimed. For example, Master et al. relates to a brushing technique, and not a jet printing technique such as recited in claim 6 of the present invention. Also, the Examiner has provided no factual evidence to support the conclusion that Pine et al. could be modified to apply flux only on critical surfaces, since Master et al. only relates to the applying of a computer method to application of brush strokes. For example, the Examiner has provided no reasonable basis as to how the structure of Pine et al. illustrated in Figures 2A-2D, could be modified to jet print flux only on selective flip-chip bumps. The

nozzles 24 are fixed nozzles directly connected to a tank 22. The Examiner has failed to make a prima facie case detailing how such modification as proposed could be made, much less why one of ordinary skill in the art would be motivated to make such a modification. The motivation is especially lacking, where Pine et al. explicitly seeks to form a uniform film of flux on the solder work surface.

For all of these reasons, claims 7-12 which depend from and limit claim 6, should be considered allowable over the combination of Pine et al. and Master et al. Reconsideration and withdrawal of the rejection of claim 7-12 under 35 U.S.C. §103(a) are therefore respectfully requested.


In light of the discussion above, this Application should be considered in condition for allowance and the case passed to issue. If there are any questions regarding this Response or the Application in general, a telephone call to the undersigned would be appreciated to expedite the prosecution of the Application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this

paper, including extension of time fees, to Deposit Account 500417 and please credit any
excess fees to such deposit account.

respectfully submitted,

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